State of Vermont

AGENCY OF ENVIRONMENTAL CONSERVATION

Montpelier, Vermont 05602

Department of Fish and Game
Department of Forests, Parks, and Recreation
Department of Water Resources & Environmental Engineering
Natural Resources Conservation Council

DEPARTMENT OF FORESTS, PARKS AND RECREATION

Central Vermont District
RD #1 - Box 2300
Morrisville, VT 05661

NOV 3 REC'D

October 31, 1986

Margaret Miller-Weeks
USDA Forest Service
P. O. Box 640
Durham, N. H. 03824

Dear Margaret:

Here is my Annual Insect and Disease Conditions Report for the northern half of Vermont. It should meet your needs for many of our pest problems that are confined to my region. Barb will send you her report when it is finished, to complete the picture.

Sincerely,

Ron

Ronald S. Kelley

RSK:hs
CC: H. B. Teillon

AGENCY OF ENVIRONMENTAL CONSERVATION
DEPARTMENT OF FORESTS, PARKS & RECREATION

STATE OF VERMONT

FOREST INSECT AND DISEASE CONDITIONS
NORTHERN REGION

CALENDAR YEAR 1986

Prepared by:

Ronald S. Kelley
Forest Resource Protection
October 1986

INTRODUCTION

The information in this report is based largely on ground surveys and observations of Forest Resource Protection personnel and other forestry staff, as well as annual aerial surveys made between 12 August and 2 September 1986.

The winter of 1986 had near normal snowfall and temperatures but a severe ice storm in late January damaged many trees. The spring and summer months were generally much colder and wetter than normal, except for April which was drier than normal. A severe frost on 3 June caused widespread heavy damage to current foliage of many hardwoods and softwoods, with temperatures as low as 19°F and commonly in the mid to upper 20° range being recorded in much of the region. An earlier frost in May also damaged hardwoods in scattered, upper elevation sites.

The continual wet weather was conducive to the spread of many tree diseases. Foliage diseases were particularly noticeable on many species of trees. These combined with off-color and thin crowns resulting from the frost gave tree crowns an unhealthy appearance for the remainder of the growing season. On a more positive note, a return to more normal or above normal precipitation levels should benefit future tree growth.

FOREST INSECTS

Hardwood Defoliators

Gypsy Moth, Lymantria dispar, populations remain very low. Numbers of large larvae counted in the Arrowhead Mountain focal area study site in Milton were similar to numbers counted in 1985. Counts of live larvae at the Brigham Hill site in Colchester were higher, ranging from 16 to 57 per 7.5 meter radius plot. This was a new area this year so trend is unknown. Mortality here increased noticeably by the fifth and sixth instars, at which time about one-fourth of the larvae under burlap bands were dead.

Forest Tent Caterpillar, Malacosoma disstria, populations remained very low, with no visible defoliation. Pheromone traps were placed in the same four sugar maple stands as trapped for the first time in 1985, in the towns of Roxbury, Bethel, Waterbury and Fairfield. Average moth catch per trap for five traps per location ranged from 0.2 to 0.8 and averaged 0.6 for all locations, the same average as for 1985. This indicates that populations probably remain static at very low levels. By continuing the annual use of these traps, we should be able to predict any future increase in population levels before noticeable defoliation occurs.

Total acres defoliated by forest tent caterpillar between 1977 and 1982 were determined by overlaying consecutive years of defoliation mapped during annual aerial surveys. This process revealed that 364,354 acres in the region were defoliated at least once, of which 28,000 acres received at least three consecutive years of defoliation. No new areas of mortality associated with the insect were detected by aerial survey this year. Total acres of dieback and mortality associated with the outbreak remain at 25,534 for the region and 33,000 for the state.

Table 1. Acres defoliated by Forest Tent Caterpillar from 1977-1982 by number of years defoliated.

	Number of Years Defoliated				
	1	2	3	4	5
Acres	275,850	60,530	21,730	4,800	1,450

Statewide, nearly 498,000 acres received at least one defoliation. This represents a little over one-fourth of all the northern hardwood type in the state. 32,000 of these acres received at least three consecutive defoliations.

A statewide Forest Tent Caterpillar Impact Survey was conducted in 1984 and 1985 by surveying randomly selected points within 40 defoliated stands with visible mortality as detected during aerial surveys, 43 defoliated stands without visible mortality and 16 undefoliated stands. Data was derived from at least five prism points (10 BAF) per stand. The data has not been fully analyzed yet but a preliminary analysis of the crown condition of the sugar

maple basal area shows a trend of increasing tree mortality and crown dieback with increasing years of defoliation (Table 2).

Table 2. The impact of Forest Tent Caterpillar Defoliation on sugar maple tree condition (preliminary results, subject to minor change).

No. of Stands	Average Percentage of Sugar Maple Basal Area					
		With Crown Dieback				
	Dead	75%	50-75%	25-50%	1-25%	0
				-Mortality Stratum*-		
40	6	2	8	12	46	26
				-Defoliated 3 Years-		
14	2	3	2	7	45	41
				-Defoliated 2 Years-		
16	3	0.3	3	10	52	32
				-Defoliated 1 Year-		
13	0.4	1	2	7	45	45
				-Non-Defoliated-		
16	0.2	0.2	2	2	24	72

*Most of these stands received 2-3 years of defoliation.

Average sugar maple mortality does not exceed one percent of the basal area until trees have been defoliated at least twice (Table 2). Most of the dead trees averaged eight to 14 inches DBH, with no trees over 20 inches DBH dead. Undefoliated stands had 72 percent of their sugar maple basal area with no observable crown dieback compared to 26-45 percent in this "perfect health" category for defoliated stands. Trees with over 75 percent dieback seldom recover, so if we consider these dying, percentage of sugar maple basal area dead or dying for stands zero, one, two or three years defoliated, or within the mortality stratum averages 0.4, one, three, five and eight percent, respectively. Individual stands most severely damaged within these strata averaged two, three, 13, 24, and 60 percent of the basal area dead or dying, respectively. Thus, stands with up to one year of defoliation lost no more than three percent of their sugar maple basal area compared to up to a 60 percent loss for stands defoliated two or more times.

Once all of the data has been analyzed, a final report will be made available, to include silvicultural recommendations for reducing potential impacts of this insect. At present, the best advice we can offer based on information to date plus numerous observations, is to avoid thinning hardwood stands, particularly poletimber and young sawtimber stands, just prior to, during, or immediately after a major defoliation. Since there is some information to indicate that hardwoods actually lose vigor for the first two

years following thinning, it would be adviseable not to thin within four years of an outbreak, provided we can forecast that far in advance. Although we have data from one stand that indicates no problem from thinning immediately after a defoliation, there are other examples where much of the residual stand was lost when this was done. Since dieback and mortality doesn't peak until about three years after defoliation, it would be adviseable to wait this long before marking the trees to be removed.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Birch Leaf Miner *Fenusa pusilla*	Gray Birch White Birch	Throughout	Lighter damage than in 1985 in Champlain Valley but heavier elsewhere. 1051 acres of defoliation aerially mapped in Orleans, Caledonia and Essex Counties.
Birch Leaf Folder *Ancylis discigerana*	Yellow Birch	Warren	Light damage to yellow birch within a sugarbush
Birch Skeletonizer *Bucculatrix canadensisella*	White Birch Yellow Birch		This insect was not observed, but light to moderate leaf skeletonizing caused by an unknown defoliator was common through the region
Bruce Spanworm *Operophtera bruceata*			Not observed
Eastern Tent Caterpillar *Malacosoma americanum*	Cherry Apple	Widespread	Populations remain light; only occasional nests observed
Elm Leaf Beetle *Pyrrhalta luteola*	American Elm Chinese Elm	Scattered throughout	Populations down from last year in Addison County, but up in the Connecticut Valley
Fall Cankerworm *Alsophila pometaria*			Not observed

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Fall Webworm *Hyphantrea cunea*	Many hardwoods and shrubs, including cherry, apple, and maple	All counties except Orleans, Caledonia and Essex	Light populations but more common than in 1985
Forest Tent Caterpillar *Malacosoma disstria*			See narrative
Green Striped Mapleworm *Anisota rubicunda*	Red Maple Sugar Maple	Danville Groton	Larvae occasionally observed but no noticeable defoliation
Gypsy Moth *Lymantria dispar*			See narrative
Half Winged Geometer *Phigalia titea*	Red Oak	Middlesex	A few larvae observed
Large Aspen Tortrix *Choristoneura conflictana*			Not observed
Linden Looper *Erranis tiliaria*			Not observed
Locust Leaf Miner *Odontata dorsalis*	Black Locust	Chittenden and Orange Counties	Localized, moderate damage
Maple Leaf Cutter *Paraclemensia acerifoliella*	Sugar Maple	Widespread	Only light defoliation reported except for moderate to heavy defoliation of one sugarbush in Braintree
Maple Trumpet Skeletonizer *Epinotia aceriella*	Sugar Maple Red Maple	Scattered throughout	Populations remain very light

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Maple Webworm *Tetralopha asperatella*	Sugar Maple	Lamoille County	Light defoliation in one area
Mountain Ash Sawfly *Pristophora geniculata*	Mountain Ash	Widespread	Common on ornamentals and wild trees; populations up from 1985
Pin Oak Sawfly *Caliroa sp.*			Not observed
Saddled Prominent *Heterocampa guttivata*	Sugar Maple Beech	Orange, Washington, Caledonia Counties	Occasional larvae observed; more numerous than in 1985 but no noticeable defoliation
Satin Moth *Leucoma salicis*	Poplar	Chittenden County Newport	Numerous on scattered ornamentals
Solitary Leaf Roller *Sparganothis pettitana*	Sugar Maple		Not observed
Spring Cankerworm *Paleacrita vernata*			Not observed
Uglynest Caterpillar *Archips cerasivoranus*	Cherry	Widespread	Occasional tents observed
Apple & Thorn Skeletonizer *Anthophila pariana*	Flowering Crab	Orleans County	Moderate damage to ornamentals
Birch Skeletonizer Unknown insect	Yellow Birch	Widespread	Scattered light to moderate defoliation evident by late summer
Cecropia Moth *Hyalophora cecropia*	High Bush Cranberry	Stowe	Heavy defoliation at one resort motel

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Cherry Scallop Shell Moth *Hydria prunivorata*	Black Cherry	Stowe	Light on two trees
Dogwood Sawfly Unidentified spp.	Gray Dogwood	South Burlington	Occasional
Japanese Beetle *Popillia japonica*	Ornamentals	Franklin, Chittenden, Addison Counties	Moderate damage
Lace Bug Unknown species	Elm	Chittenden County	Light population
Leaf Beetle *Chrysomelidae* species not yet determined	Aspen	Widespread but heaviest in Lamoille, Caledonia, Orleans and Essex Counties	Some moderate-heavy defoliation of quaking aspen
Oak Skeletonizer *Bucculatrix ainsliella*	Red Oak	Chittenden County	Widespread light defoliation in an upper elevation oak stand
Orange-humped Mapleworm *Symmerista leucitys*	Sugar Maple	Orange, Washington, Lamoille, Chittenden Counties	Occasional larvae observed
Pear Thrips *Taeniothrips inconsequens*	Sugar Maple	Widespread	Light damage, down dramatically from 1985 See narrative
Red-humped Caterpillar *Shizura concinna*	Apple	Washington	Heavy on one tree
Spotted Tussock Moth *Halysidota maculata*	Flowering Crab Aspen	Orleans, Lamoille Counties	Common in late summer but caused little damage

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Unidentified Leaf Miner	Balsam Poplar	Widespread	Heaviest defoliation in Northeast Kingdom causing large black blotches on upper leaf surface

Softwood Defoliators

Spruce Budworm, Choristoneura fumiferana, continued to be very low in 1986 with no visible defoliation for the third consecutive year. Average moth catch in pheromone traps where the same trap, lure and killing agent (flea collars) were used as in 1985 was about half as much (0.4/trap vs. 0.8/trap). This probably indicates that budworm population levels continued to drop in 1986. This also corresponds to an almost total absence of budworms during our large larvae/pupae survey this year (0.007/branch compared to 0.2/branch in 1985).

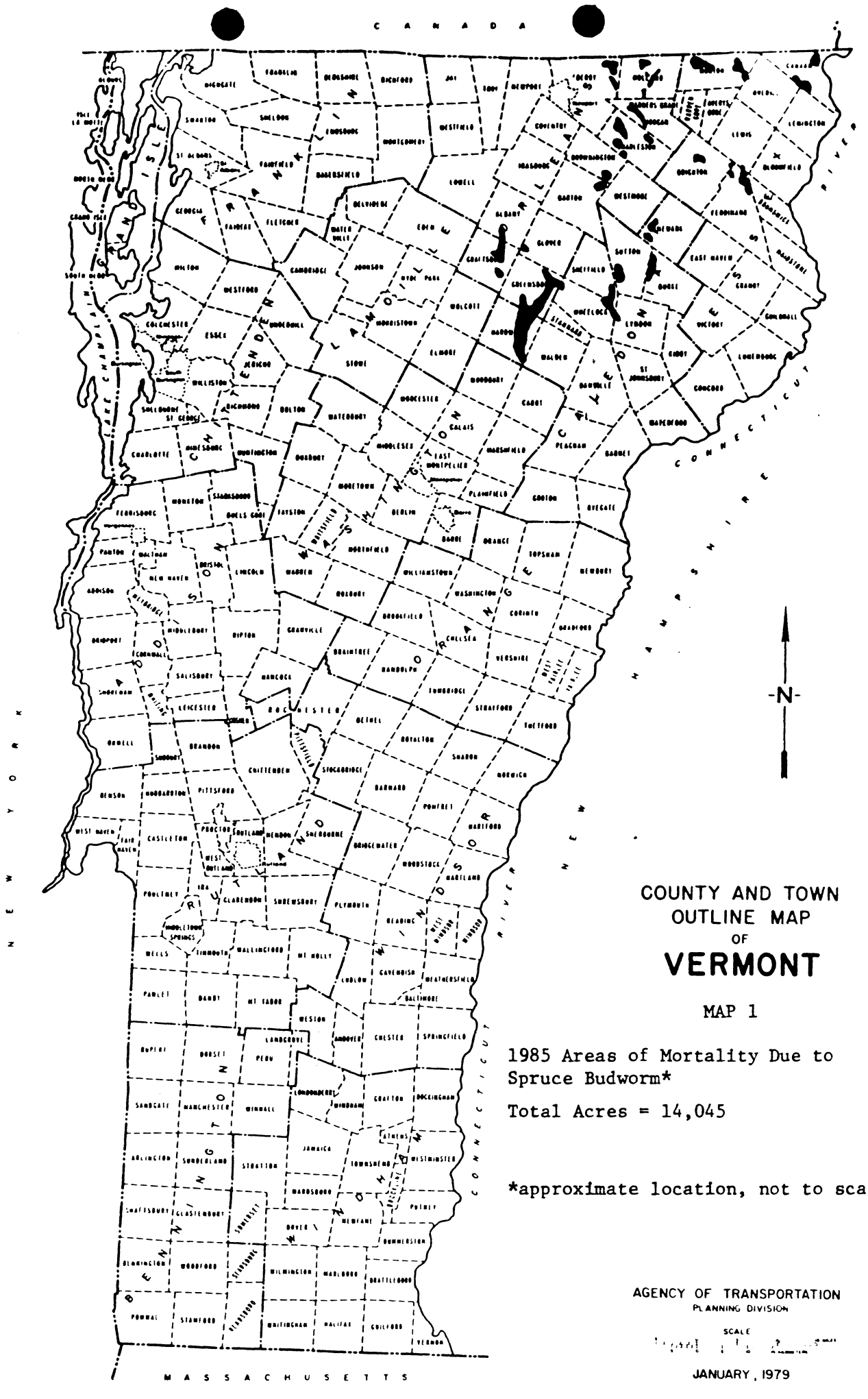
Pheromone traps were deployed in 15 stands again this year, using five traps per cluster. The trap methodology has finally been improved to the point that everyone in both Canada and the U.S. is using the same Multi-pher trap and PVC lure, and with the addition of Vaportape II as a killing agent this year, traps everywhere were reported to be working well. Our Multi-pher traps with Vaportape averaged 1.2 moths per trap in 1986. Eight of 15 plots caught moths in 1986 while five of these plots yielded overwintering (L_2) larvae from five branches collected in September 1985. So, pheromone trapping appears to be at least as sensitive as L_2 surveys for detecting extremely light populations.

Spruce-fir mortality detected during the annual aerial survey increased slightly from 11,750 acres in 1985 to 14,045 acres this year. This is probably due to better detection weather during the survey this year rather than any actual increase in damage (Table 3, Map 1).

Table 3. Acres of Mortality in 1986 due to Spruce Budworm

	Acres of Mortality*			
County	Light	Moderate	Heavy	Total
Caledonia	228	1,521	1,961	3,710
Essex	75	2,441	2,785	5,301
Orleans	243	2,131	2,660	5,034
TOTAL	546	6,093	7,406	14,045

*Light mortality = 1-10%, scattered or patchy
Moderate mortality = 11-25%, scattered
Heavy mortality = over 25%



COUNTY AND TOWN OUTLINE MAP OF VERMONT

MAP 1

1985 Areas of Mortality Due to Spruce Budworm*

Total Acres = 14,045

*approximate location, not to scale

AGENCY OF TRANSPORTATION
PLANNING DIVISION

SCALE

JANUARY, 1979

Budworm-caused mortality of fir and spruce that occurred during the past year was estimated from a survey of 11 plots that contain light, moderate, and heavy mortality. Mortality rates (percent of original number of trees over 4.5 inches DBH) for 1985 were 3.2, 4.5 and 6.8 percent, respectively, for lightly, moderately, and heavily damaged stands compared to 2.5, 2.5, and 6.5 percent in 1985. These percentages were applied to average per acre volume and density data from the 1980 Orelans County Spruce Budworm Mortality Survey and acres of mortality from Table 3 to produce the loss estimates in Table 4.

Table 4. Estimated tree mortality in 1986 due to Spruce Budworm

County	Number of Trees Dead	Total Volume Lost (Cords)
Caledonia	48,000	5,150
Essex	69,280	7,430
Orleans	65,340	7,010
TOTAL	182,620	19,590

Surprisingly, mortality rates for 1986 were slightly higher than in 1985. The total volume loss for 1986 is estimated at 19,590 cords compared to 14,430 cords for 1985. Timber value of 1986 losses, based on an average of $8.00 per cord, is $156,720.

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Arborvitae Leaf Miner *Argyresthia thuiella*	Arborvitae Northern White Cedar	Scattered throughout	Mostly light damage
Introduced Pine Sawfly *Diprion similis*	White Pine Scots Pine	Widespread	Unusually common on pine Christmas trees this year but causing little damage
Larch Casebearer *Coleophora laricella*	Eastern Larch	Vershire Hyde Park	Light defoliation; populations up somewhat where observed
Larch Sawfly *Pristophora erichosonii*	Eastern Larch	Hyde Park	Light population in one area
Red Headed Pine Sawfly *Neodiprion lecontei*	Red Pine Scots Pine	Georgia, Essex, Roxbury, Wolcott	Light populations but more common than in 1985; moderate damage to a few Scots pine Christmas trees in Wolcott

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Spruce Budworm *Choristoneura fumiferana*			See narrative
Spruce Bud Moth *Zeiraphera canadensis*	White Spruce	Essex, Orleans, Caledonia Counties	Very light populations
White Pine Sawfly *Neodiprion pinetum*	White Pine	East Concord	Light defoliation on one ornamental
Yellow-headed Spruce Sawfly *Pikonema alaskensis*	White Spruce Red Spruce	Westfield Barre	Moderate to heavy defoliation of ornamentals
Nursery Pine Sawfly *Diprion frutetorum*	Scots Pine Red Pine	Barre Morristown Bakersfield	Light defoliation only; a solitary feeder
Pine Nesting Sawfly *Acantholyda zappei*	Scots Pine	Williston	Light damage

Sapsucking Insects

Oystershell Scale, *Lepidosaphes ulmi*, populations have noticeable increased during the past two years. This year, heavy populations were reported causing dieback on ornamental oak and wild apple in Lamoille County, as well as on beech in scattered Chittenden County locations. Mortality of understory beech and heavy dieback of overstory beech was evident in hardwood stands in Bolton and Georgia, wherever small pockets of almost pure beech occurred (Figures 2 and 3). Elsewhere, light populations of scale were commonly found on beech, sugar maple, striped maple, and yellow birch.

Pear Thrips, *Taeniothrips inconsequens*, damage to sugar maple foliage dropped dramatically this year. Since leaf emergence was much faster than normal this year, and most damage is done by the adults feeding within expanding buds, this may have been a factor in the reduced amount of damage observed.

Tanglefoot-coated styrofoam cups placed in sugarbushes just after thrips

emergence began caught few adults, despite the fact that they were plentiful in expanding buds and on expanding leaves. Counts from expanding buds are preferred as a survey method but this requires close monitoring of bud development for correct timing of the survey.

Experimental ground treatments using Sevin 80S when sugar maple leaves were one-third full size resulted in a 97-98 percent reduction in the number of thrips larvae. Spraying at this time would not prevent damage in the year of treatment but should reduce populations for the following year and might be justified in sugarbushes if thrips became a persistent problem.

Pine Leaf Chermid, Pineus pinifoliae, damage from 1985 infestations was widespread and very common this year. Scattered shoot dieback caused by this aphid was reported in 12 white pine Christmas tree plantations comprising 127 acres as well as in two Scots and one red pine plantation. Shoot dieback on wild white pine was also very common. This insect alternates between red spruce and pine, spending a year on each host. Eggs are laid in late June on previous year needles of white pine and hatching nymphs migrate to the new shoots and feed on them, frequently killing them. This year most of the insects were forming galls on red spruce. Look for them on white pine in 1987.

OTHER SAPSUCKING INSECTS, MIDGES & MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Gall Midge Paradiplosis tumifex	Balsam Fir	Widespread	Populations mostly light; only 15 acres of moderate Christmas tree damage known compared to 95 acres in 1985
Balsam Twig Aphid Mindarus abietinus	Balsam Fir	Widespread	Populations increased in some plantations but decreased in many others so that overall Christmas tree damage levels decreased slightly compared to 1985, particularly in the heavy category
Balsam Woolly Aphid Adelges piceae			Not observed
Cooley Spruce Gall Aphid Adelges cooleyi	Douglas-Fir Blue Spruce	Chittenden, Orange Counties	Mostly light damage to spruce ornamentals and Douglas-fir Christmas trees
Eastern Spruce Gall Aphid Adelges abietis	Red Spruce White Spruce	Widespread	Common on ornamentals; an occasional problem on Christmas trees

OTHER SAPSUCKING INSECTS, MIDGES & MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Oystershell Scale *Lepidosaphes ulmi*			See narrative
Pine Bark Aphid *Pineus strobi*	White Pine	Widespread	Commonly observed, reported as present in 7 Christmas tree plantations comprising 90 acres. It was not detected in these plantations in 1985
Pine Needle Midge *Contarinea baeri*	Scots Pine	Bakersfield	Light damage to Christmas trees
Pine Spittlebug *Aphrophora parallela*	White Pine Scots Pine Red Pine	Widespread	Common on Scots pine Christmas trees for second year in a row, but less common on white pine. 174 acres infested, of which 80 acres had moderate-heavy infestations; little damage observed
Root Aphid *Prociphilus americanus*	Balsam Fir Fraser Fir	Lamoille County	Still present in young Christmas tree plantings but no new locations reported. Also reported to be common on roots of wild balsam fir seedlings
Spruce Spider Mite *Oligonychus ununguis*	Fraser Fir Balsam Fir Hemlock	Lamoille, Orange, Chittenden Counties	Some scattered, moderate damage to Christmas trees, especially young seedlings. Where both Fraser and balsam fir are grown, Fraser appears to be preferred
Aphids *Cinera sp.*	Balsam Fir White Pine	Elmore Brookfield	Occasionally observed on Christmas trees. Responsible for foliage yellowing on white pine Christmas trees, making some of them unmarketable
Gouty Vein Midge *Dasineura communis*	Sugar Maple	Essex	Noticeable on maples at the nursery, but not damaging

OTHER SAPSUCKING INSECTS, MIDGES & MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Lecanium Scale *Lecanium sp.*	Sugar Maple Striped Maple Red Oak	Hyde Park, Georgia, Morrisville	Light populations on maples in scattered hardwood stands; moderate on red oak ornamental in Morrisville. See Figure 1
Pine Leaf Chermid *Pineus pinifoliae*			See narrative
Pear Thrips *Taeniothrips inconsequens*			See narrative
Pine Needle Scale *Phenacapsis pinifoliae*	Scots Pine	Middlebury, Essex Junction	Heavy on a few Christmas trees in Middlebury; light on ornamental in Essex

BUD, SHOOT & STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Shoot-boring Sawfly *Pleroneura bruneicornis*	Balsam Fir Fraser Fir	Scattered	Expected to be more prevalent than in 1985 and started out this way but damage was difficult to detect because of widespread frost damage to new growth
Northern Pine Weevil *Pissodes approximatus*			Not observed
Northern Pitch Twig Moth *Petrova albicapitana*	Scots Pine	Craftsbury, Orange, Wolcott	Causing scattered light branch mortality in three Christmas tree plantations

BUD, SHOOT & STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Pales Weevil *Hylobius pales*	Scots Pine	Widespread	Damage detected in 18 Christmas tree plantations (308 acres) compared to six plantations (137 acres) in 1985. Little twig mortality in most locations however
White Pine Weevil *Pissodes strobi*	White Pine Scots Pine Blue Spruce Norway Spruce White Spruce	Widespread	More noticeable than usual in Christmas tree plantations causing scattered terminal mortality in eight white pine and six Scots pine plantations, totalling 108 and 70 acres, respectively
Maple Petiole Borer *Caulocampus acericaulis*	Sugar Maple	Richmond, Hardwick	Some damage to ornamentals but less than in 1985
Poplar Petiole Gall *Ectoedemia populela*	Quaking Aspen	Chittenden, Lamoille, Orange, Caledonia Counties	Common this year but not damaging
Pitted Ambrosia Beetle *Corthylus punctatissimus*	Sugar Maple Seedlings	Scattered throughout	Scattered light mortality of seedlings, especially where sugar maple reproduction was thick
Ghost Moth *Hepialis gracilis*	Red Spruce Balsam Fir	Scattered	Root feeding associated with upper elevation spruce and fir decline
Twig Pruner Unidentified species	Oak	Burlington	Light damage

BARK BEETLES

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Fir Bark Beetle *Pityokteinis sparsus*	Fraser Fir	West Fairlee	Associated with the death of scattered Christmas trees in one plantation. Trees thought to be stressed by excess water
Eastern Larch Beetle *Dendroctonus simplex*	Eastern Larch	Widespread	Associated with Larch Decline
Elm Bark Beetles *Hylurgopinus rufipes* *Scolytus multistriatus*	American Elm	Widespread	See Dutch Elm Disease

FOREST DISEASES

Stem Diseases

Scleroderris Canker, caused by Gremmeniella abietina, was found in two previously negative towns this year compared to eight in 1985 (Map 2), during a survey of 84 plantations in 10 towns bordering the quarantine zone. The new infections were found in a 20 acre red pine plantation in Essex and a two acre red pine plantation in Roxbury.

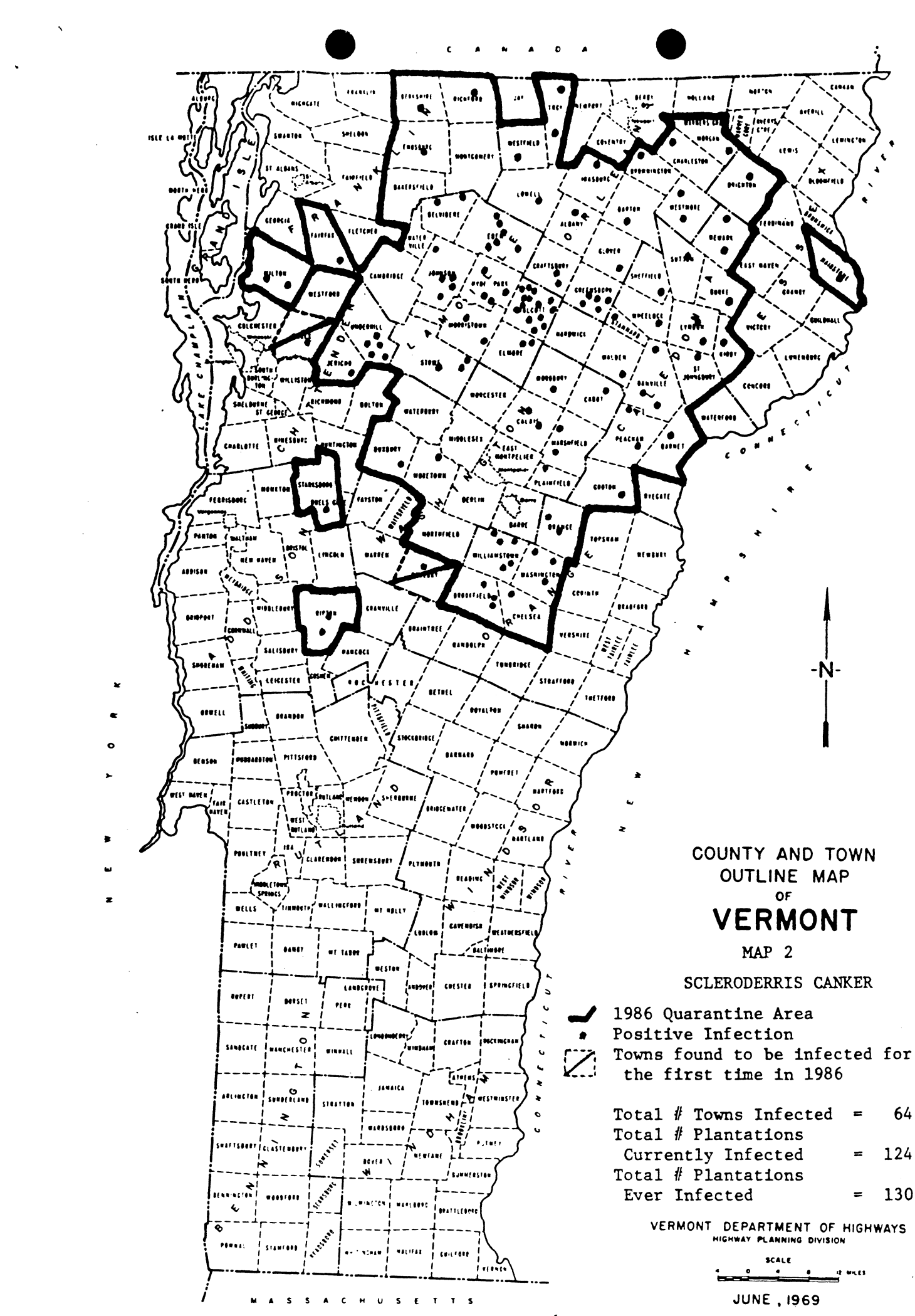
Fifty-one pine Christmas tree plantations within 27 towns inside the quarantine area were inspected this year. The disease was not found in any previously uninfected plantations.

Scleroderris continues to cause tree and branch mortality of understory Scots and white pine in the Lyndon State Forest. Thirty-six percent of the branches on Scots pines and 13 percent of the branches on white pines examined had died during the past year due to Scleroderris. Shoot dieback observed in 1986 (due to 1985 infections) was considerably lower than in 1985. New shoot infections on Scots pine averaged 0.2 per live branch in 1986 compared to 2.1 per live branch in 1985. New shoot infections on white pine beneath Scots pine or beneath white pine averaged 0.2 and 0.03 per live branch, respectively, compared to 0.3 and 0.05 in 1985.

Infection of the white pine seedlings planted in 1984 was also down, with 12 percent of the seedlings newly infected compared to 29 percent in 1985. The incidence of infection was noticeably higher on seedlings closest to the Scots pine overstory. Hopefully, the removal of Scots pine saplings within the interior section of the planting site in 1985 is responsible for the reduced infection there.

The total number of plantations in the state known to be infected is now 124, consisting of 106 red pine and 18 Scots pine plantations. This represents 842 and 150 acres, respectively, for a total of 992 acres infected. Another six plantations were infected at one time but have since had the disease eradicated or the trees cut.

Eastern dwarf mistletoe, caused by Arceuthobium pusillum, was discovered for the first time in Vermont, in an old growth red spruce stand in Hancock. This parasitic plant was forming large witches brooms (Figure 4) and causing heavy branch mortality and some tree mortality. It is likely to be more widespread in the state than presently known.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

MAP 2

SCLERODERRIS CANKER

1986 Quarantine Area
Positive Infection
Towns found to be infected for the first time in 1986

Total # Towns Infected	=	64
Total # Plantations Currently Infected	=	124
Total # Plantations Ever Infected	=	130

VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE

JUNE, 1969

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Beech Bark Disease *Cryptococcus fagisuga* and *Nectria coccinea* var. *faginata*	American Beech	Throughout	Scale insect and accompanying nectria continues to increase in many locations. Some stands of heavy scale and nectria observed in Orleans County; 371 acres of damage in Orleans and Caledonia Counties detected during the aerial survey
Cytospora Canker *Cytospora kunzei*	Blue Spruce	Widespread	Common on ornamentals
Dutch Elm Disease *Ceratocystis ulmi*	American Elm	Throughout	Heavier than usual again this year; mortality of young trees especially common
Fireblight	Mountain Ash Plum Cherry	Widespread	Scattered branch and tree mortality on ornamentals. More common than usual due to cool, wet weather
Hypoxylon Canker *Hypoxylon pruinatum*	Quaking Aspen	Throughout	Remains a common cause of mortality in aspen stands
Scleroderris Canker *Gremmeniella abietina*			See narrative
Verticillium Wilt *Verticillum albo-atrum*	Maple	Chittenden County	Light damage
White Pine Blister Rust *Cronartium ribicola*	White Pine	Throughout	Heavy damage continues; becoming more of a problem in Christmas tree plantations. Found in 80 acres this year compared to 60 acres last year. Causing moderate tree mortality in three plantations (20 acres). Alternate host sometimes difficult to find despite widespread pine infection

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Woodgate Gall Rust *Endocronartium harknessii*	Scots Pine	Widespread	Detected in 16 Christmas tree plantations comprising 232 acres of which 66 acres were moderate and 20 acres were heavy due to shoot and branch mortality
Diplodia Shoot Blight *Diplodia pinea*	Austrian Pine	Essex	Moderate branch mortality
Eastern Dwarf Mistletoe *Arceuthobium pusillum*			See narrative
Phomopsis	Russian Olive	Barre	Shoot dieback on one ornamental
Sapstreak *Ceratocystis coerulescens*	Sugar Maple	Orange, Washington Counties	Trees in several locations suspect, Identification not yet confirmed
* Unidentified canker	White Pine	West Fairlee	Causing internodal pitch flow in a pine stand. Could be confused with Blister Rust but causing small cankers on smooth bark only and not associated with branches. Has the potential to kill trees but no mortality yet. Identification is being investigated

Foliage Diseases

Fir-fern rust of balsam fir, caused principally by Uredinopsis mirabilis, increased this year due to an extremely wet June and despite the frost damage, which killed many fir shoots as well as sensitive fern, the alternate host. 254 acres of balsam fir were found to be infected during the annual Scleroderris survey of Christmas tree plantations, of which 86 acres had moderate to heavy damage. This compares to 94 acres in 1985, of which 40 acres were moderate to heavy. Bayleton 25 provided adequate protection of fir this year if applied at bud break and again when new shoots averaged two-three centimeters (about one inch) in length. Since this was an extremely wet spring, a third treatment at about 6 cm. was needed to provide complete protection. Eliminating the sensitive fern is still recommended for long term control.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Anthracnose Gloeosporium spp.	Many	Widespread	Common this year due to wet weather, especially common in the Northeast Kingdom. Frequently observed on Butternut in Orange County
Fir-Fern Rust Uredinopsis mirabilis	Balsam Fir		See narrative
Lophodermium Needlecast Lophodermium pinastri	Scots Pine	Widespread	Mostly light damage similar to 1985 levels in Christmas tree plantations
Rhabdocline Needlecast Rhabdocline pseudotsugae	Douglas-Fir	Barton, Essex	Occasionally heavy in Christmas tree plantations
Rhizosphaera Needlecast Rhizosphaera kalkhoffi	Blue Spruce	Walden	Causing moderate needle loss in a Christmas tree plantation
Swiss Needlecast Phaeocryptopus gaumani	Douglas-Fir	Jeffersonville, Essex, Stowe	Occasionally heavy on Christmas trees
Naemacyclus Needlecast	Scots Pine	Franklin, Lamoille, Orleans Caledonia Counties	Increasing in Christmas tree plantations; 42 acres known infested, including 20 acres of moderate damage in Troy

OTHER FOLIAGE DISEASE

DISEASE	HOST(S)	LOCALITY	REMARKS
Cedar-Apple Rust *Gymnosporangium juniperi-virginianae*	Eastern Red Cedar Apple	Newport	Numerous calls on ornamentals
Fir-Fern Rust *Uredinopsis mirabilis*			See narrative
Serviceberry Rust Unidentified fungus	Serviceberry	Winooski	Light damage
Tar Spot *Rhytisma acerinum* *Rhytisma punctatum*	Red Maple Silver Maple Sugar Maple	Widespread	*R. punctatum* which produces many small spots that don't coalesce was extremely common on sugar maple for the first time this year. Especially heavy on understory leaves in sugarbushes. *R. acerinum* which causes large tar spots on red maple was more scattered

ROOT ROTS

DISEASE	HOST(S)	LOCALITY	REMARKS
Annosus Root Rot *Heterobasidion annosum*			No new infection sites reported
Shoestring Root Rot *Armillaria mellea*	Many	Widespread	Remains common on stressed trees exhibiting dieback

Diebacks, Declines and Environmental Diseases

Hardwood Decline continues to be noticeable throughout the region but was difficult to detect this year because of the frost damage. 943 acres of decline were aerially mapped in the Northeast Kingdom this year (Essex County-165 acres, Orleans County-242 acres, Caledonia County-241 acres) compared to 3,259 acres last year (Map 3). Most of this acreage is not associated with any known defoliation and includes such things as birch dieback and dieback and mortality of beech due to beech bark disease.

A statewide hardwood tree health survey was begun early this year by utilizing photography taken by the U.S. Forest Service late in the summer of 1985. Color-infrared transparencies at a scale of 1:8000 were obtained for 169 usable points randomly gridded over the entire state. Stereoscopes and grid overlays were used to divide a 360 acre block at the center of each point into 2.5 acre cells, which were stratified into hardwood type or other classifications. All hardwood was further stratified into two size classes and three mortality classes.

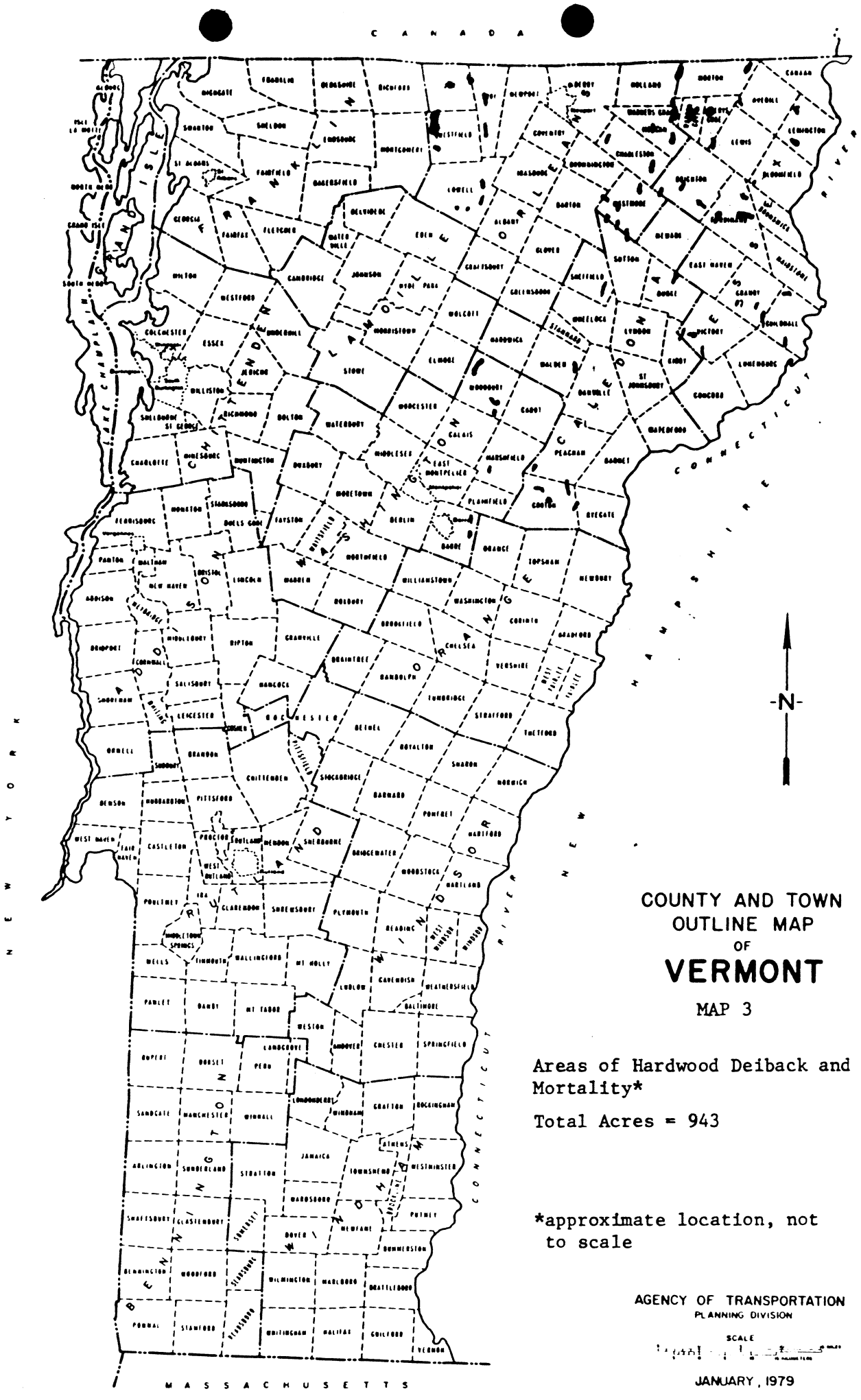
Of the 26,000 acres of hardwood examined by photography, 99.2 percent fell into the light mortality class (less than 10 percent of the trees dead). Then 10 percent of the light mortality cells and all of the moderate and heavy cells were photointerpreted for number of recently dead, older dead and declining hardwood trees. This was followed up by a ground survey of 75 cells, representing all (2) of the heavy mortality cells, 50 percent (32) of the moderate mortality cells, and five percent (51) of the light mortality cells.

Ground data on crown condition and timber volume will be used to adjust the photo date to obtain a statewide estimate of the number and volume per acre of dead and declining hardwoods. Other stand, site, tree and soils data taken during the ground survey will be analyzed to determine what factors may relate to dieback and mortality. This survey will also serve as an excellent data base for future tree health surveys. A preliminary report should be available by the spring of 1987.

Ash Dieback increased in Franklin, Chittenden, and Addison Counties. The dieback appears to be most serious on the higher and drier sites.

Birch Decline of upper elevation yellow birch was common in Orleans and Essex Counties this year. The affected trees were reported to have unusual branch development in their lower crowns.

Frost Damage was especially damaging this year. Some leaves were injured by scattered frosts in May but the heavy widespread frost that occurred 3 June was especially severe because new growth was two weeks ahead of normal and temperatures were well below freezing. Many species were affected but damage was most noticeable on balsam fir, Douglas-fir, aspen, red maple, sugar maple, beech and white ash. Many hardwood stands, especially those in the Northeast Kingdom, remained off-color for the rest of the growing season. All of the 572,900 acres of hardwood type in this district was affected to some degree, based on aerial and ground observations. Affected trees commonly suffered 10 to 25 percent foliage loss, mostly in the upper third of the tree crowns.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

MAP 3

Areas of Hardwood Deiback and Mortality*

Total Acres = 943

*approximate location, not to scale

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JANUARY, 1979

Christmas tree damage was the worst anyone can recall. Temperatures as low as 25°F were recorded near some plantations. Balsam fir, fraser fir and Douglas-fir were the most severely damaged, leaving many trees unmarketable this year (Figure 5). Some recently planted seedlings were a complete loss. In the most severe cases, heavy dieback of 1985 fir growth also occurred, with most new buds for 1987 developing on 1984 and even 1983 growth. During the annual Christmas tree survey for Scleroderris, 288 acres of fir were found to be damaged, of which 243 acres were heavily damaged. Some shoot mortality also occurred on white pine and white spruce in scattered locations. Scots pine suffered the least damage with shoot curling in the coldest locations. Damage in softwood stands was not as noticeable except for scattered areas in the Northeast Kingdom where air drainage was poor.

Ice Damage from winter storms was common this year. One such storm that occurred during the last week in January throughout most of Lamoille County and parts of Washington and Caledonia Counties was especially severe, causing heavy branch and top breakage. Damage was so noticeable that for several weeks afterwards, hardwoods above about 1200 feet in elevation on the west slope of the Worcester range appeared whitish in color due to all the fresh wood exposed. This damage is likely to provide infection counts for decay fungi and significantly affect tree quality and condition in future years.

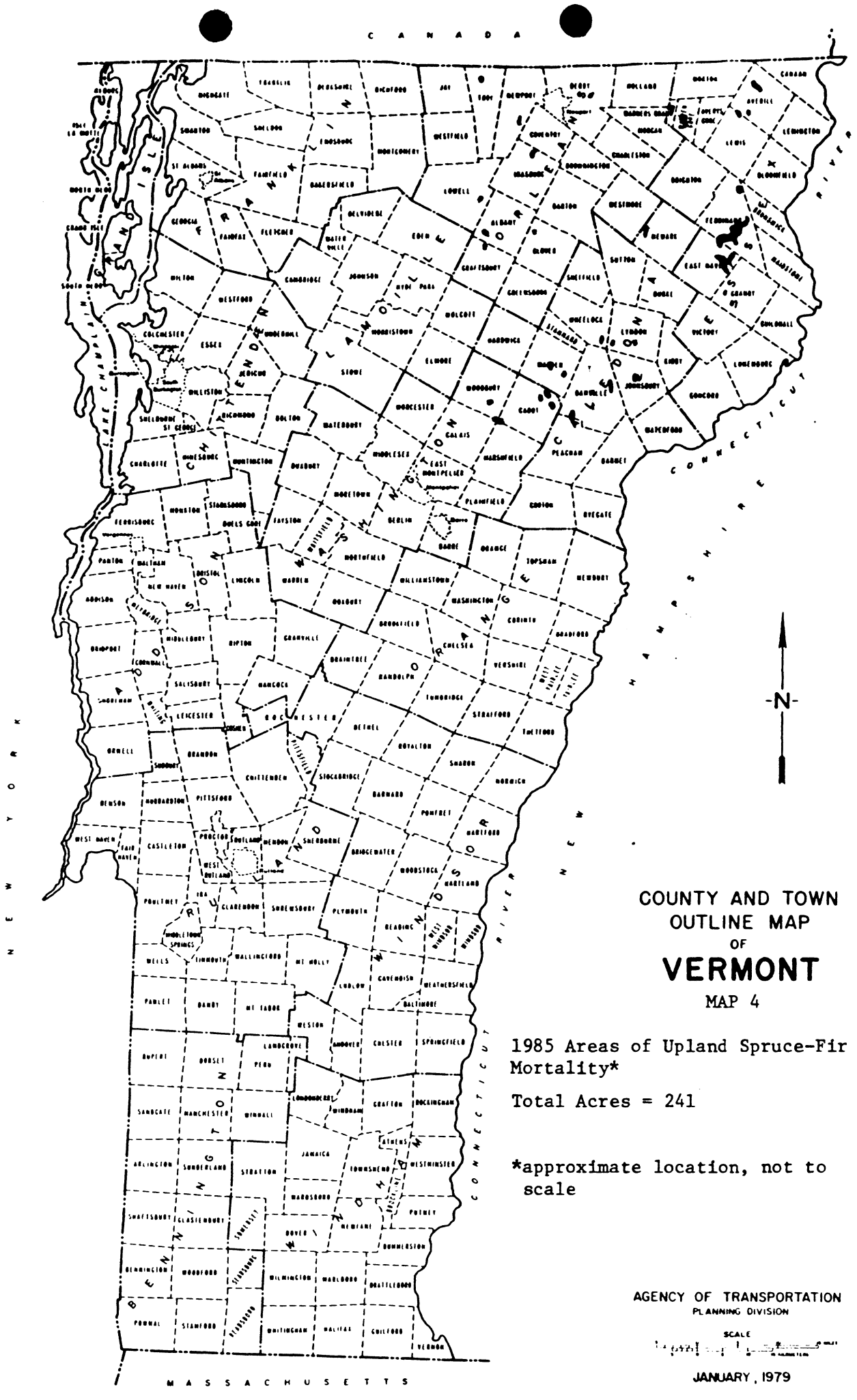
Larch Decline continues in areas of previously heavy mortality. 108 acres containing mortality were mapped in Essex, Orleans and Caledonia Counties during the annual aerial survey compared to 544 acres in 1985.

Maple Decline remains common in sugarbushes and forest stands. No new areas of dieback or mortality associated with past insect defoliation were detected this year. Various combinations of stress factors can be identified in most areas affected.

White Pine Needle Blight caused very little noticeable damage this year. Most pines that were damaged during the last three years greened up this year. One exception was widespread discoloration of white pine Christmas trees in a Brookfield plantation.

Wind Damage was reported due to "Venturi" winds in the Underhill Center area in late May and due to two major storms in Essex, Caledonia and Orleans Counties that occurred on 16 June and 23 June. Winds in these later storms were recorded up to 80-90 miles per hour. Damage was in a narrow band through Sutton, the edge of Barton, and into East Haven. Trees were uprooted or twisted, causing vertical stem cracks. Twenty-three acres of windthrow associated with this damage was reported.

Red Spruce Decline remains common in high elevation sites as well as in scattered well-drained low elevation sites. 241 acres of upper elevation spruce decline were aerially mapped in Orleans, Essex and Caledonia Counties (Map 4). This year the Ghost Moth, Hepialis gracilis, was found to be feeding on the roots of declining spruce and fir on Camel's Hump and was commonly found in other high elevation sites where decline is present. It may be an important factor in the observed decline.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

MAP 4

1985 Areas of Upland Spruce-Fir Mortality*

Total Acres = 241

*approximate location, not to scale

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SCALE

JANUARY, 1979

ANIMAL DAMAGE

ANIMAL	SPECIES DAMAGED	LOCALITY	REMARKS
Deer	Cedars	Swanton	5-10% defoliation of a hedge
Mouse			Not observed
Porcupine	Many	Scattered	Populations increasing somewhat. Damaged a 20 year old white pine stand in Barre. Also damaging pressure treated decks
Squirrel	Maple Oak Maple Tubing	Scattered throughout	Cutting fine twigs for sap; cutting oak branches for mast. Several complaints from sugar-makers on tubing damage

Figure 1. Lecanium Scale on a maple twig.

Figure 2. Twig mortality and leaf stunting of beech due to Oystershell Scale.

Figure 3. Heavy crown dieback of beech due to Oystershell Scale.

Figure 4. Large witches-brooms on red spruce caused by eastern dwarf mistletoe.

Figure 5. Heavy frost damage to a balsam fir Christmas tree.